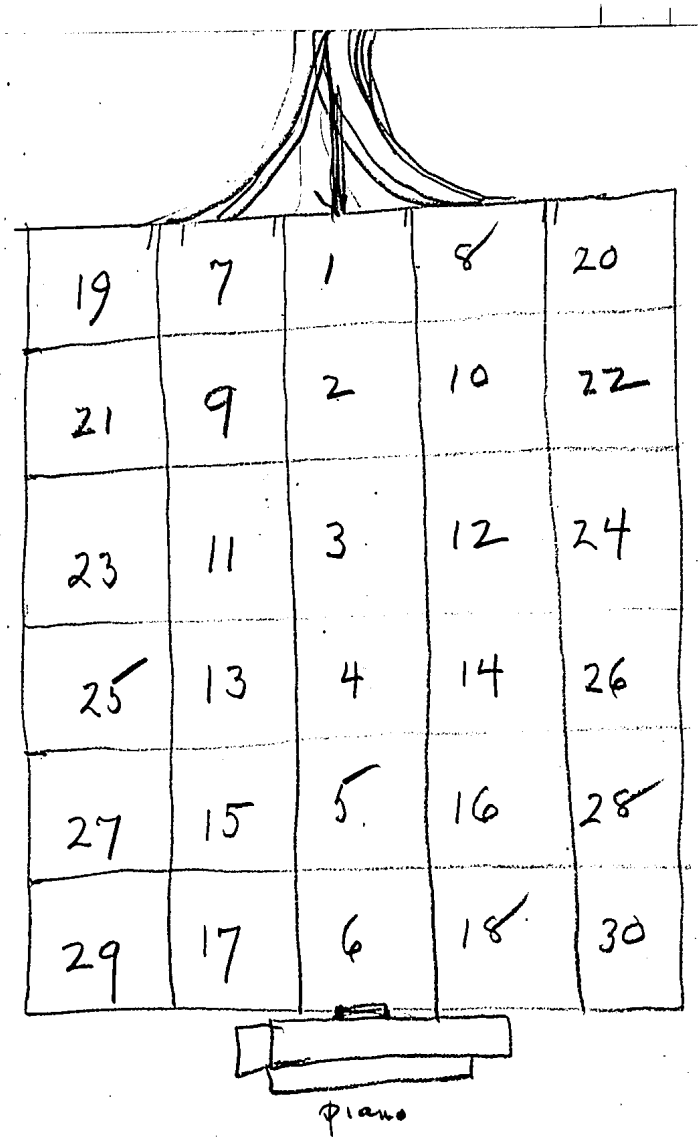
Notebook Series -- Notebooks by Edison
Notebook, N-15-12-20.2

This notebook was used by Edison during the period December 1915-January 1916 for experiments pertaining to sound recording. Included are notes on the quality and loudness of recordings made with different numbered recorders, various arrangements of equipment and musicians in the recording studio, and different shapes of the recording chamber. One entry contains the notation, "we can control quality by chamber size to a great extent." The experimental recorders referred to in this notebook are described in earlier books by Absalom M. Kennedy, such as N-14-09-21. Many of them are evaluated by Edison and Kennedy in N-15-11-19, which also describes the outfit of the recording studio. Experiments involving the arrangement of the studio include changes in the location of musicians and instruments, the dampening of sound through various methods, the use of different instrumentation, and changes in the instruments. The locations of musicians in some recordings are indicated with reference to a numbered grid on the front flyleaf of the book. The front cover is marked "Edison." The pages are unnumbered. Approximately 70 pages have been used.

86769

Acme Co.,

MFG. STATIONERS,
96 JOHN ST.
AND
19 PLATT ST.
NEW YORK.

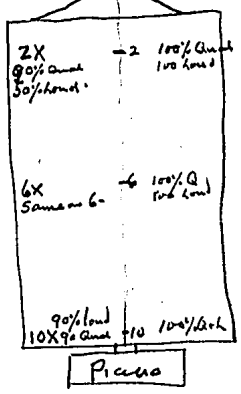


cowhair chamber recording

see notebook N-15-10-21 also

L. S. Burt
12/26/73

Dec 20 1915



Singing at these positions to determine loudness & quietness

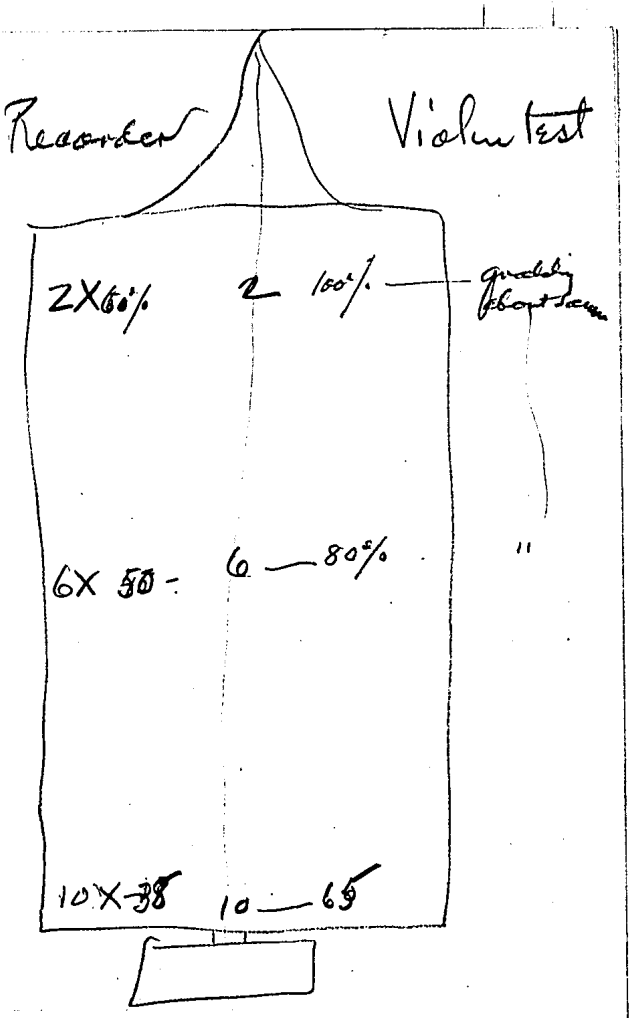
Length of Ch chamber — 12'
Height — 8'
Width 9'

In this test #57 scratches Considerable

Of the Quality of course. 10 ft is better than 6 & 6 better than 2 ft —
The % are only for Comparison between middle & Scales —

#57 has changed over Sunday so it is now scratchy on tracking whereas previously it was smooth tracking
Tried warming white Record NG
Closed CH chamber NG
still scratchy —
Later - 57 ok on blowing chips too strong

#57 Recorder Violin test



Quality about same on scales as in Cenley

Test on slot of Piano -

1 =	6" X 24"	100 %	quality 100
2	3 X 24	70 %	" 100
3	6 X 12	100	" quality 105
4	3 X 12	70	"

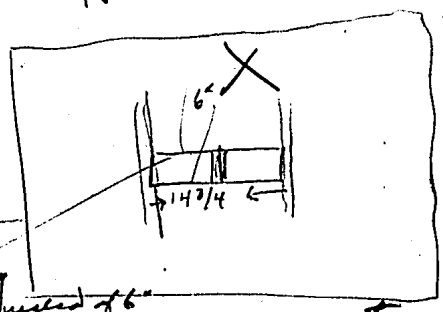
Slot like X -

Very little deffenence

think 3 X 6

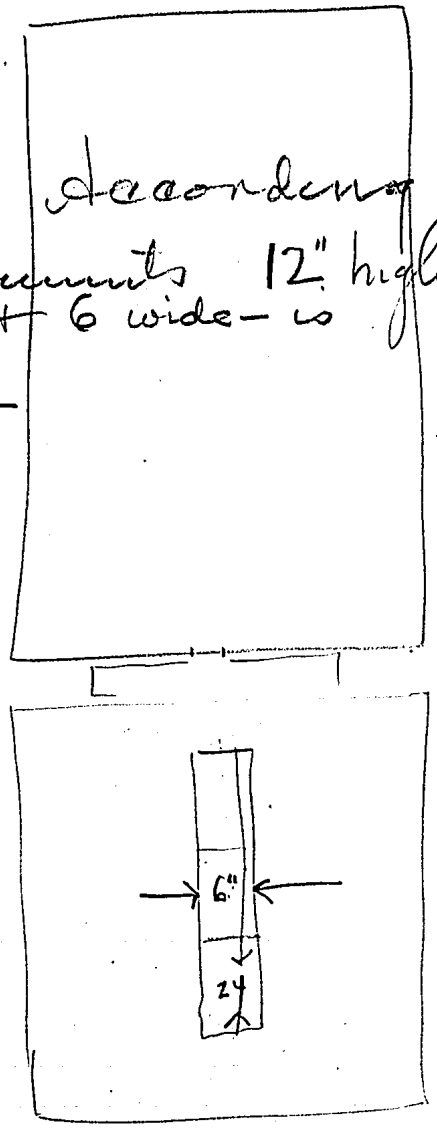
Center is

Louder



also 14 3/4 Long
12" wide instead of 6"
Loudness about same but more mellow not so sharp -

According to
Experiments 12" high
& 6 wide - is
Best -



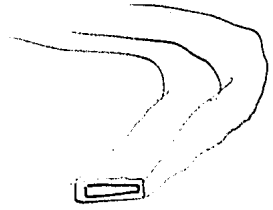
Experiment with blowing tube for chaps —

Put Cock in —

No air	100 —
1/4 turn of Cock	100
1/2 "	100 —
3/4 "	175
all on —	300 —

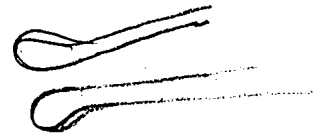
This shows that air surface is largely due to air on certain occasions &

that we must regulate it —



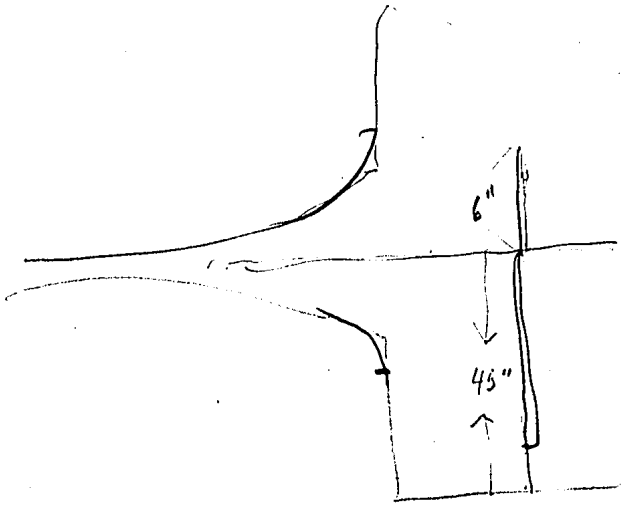
$\frac{1}{32}$ dia $\frac{1}{4}$" long

am making it this



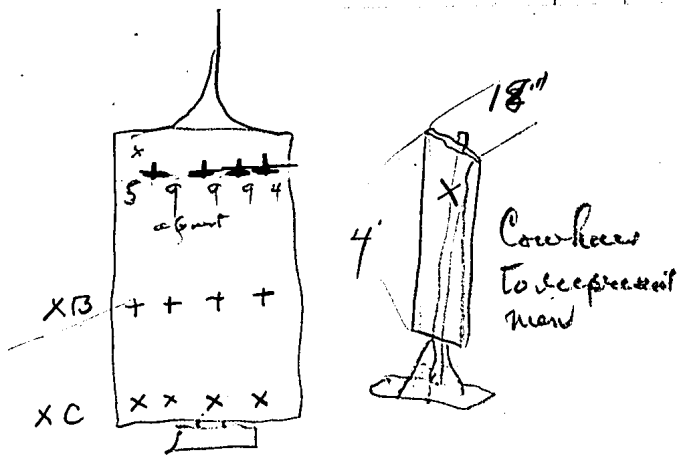
So no sharp Edges — & polished —

Its set $\frac{1}{4}$ from wax & much back from ball — So Kennedy says —



with Dummies 1/2 way in Chamber XB —
Volume diminishes from 100 to 60%

XC — 1 ft from end of Chamber & 1 dummy directly in front of slot of Piano —
about 50% —

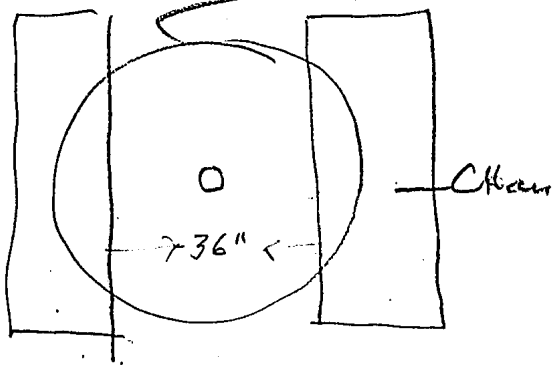


Playing Piano, with & without,

With X there is not much difference in Volume of Piano probably 100% without X to 85% with Dummys.

~~XC~~

Dec 21 1915



Piano only 60% loudness as without, softer –

Overwoods Wally – in 9X10 Air Chamber 10 ft F.
Made into Blue antennal
Playing soft ear hear nothing
horn hear all good quality but
weak – Meadium playing
Can hear faintly well

Ear, fairly loud with horn
played very loud —
Can hear it plain with
Ear about 2 ft on a
weak Condenser Record
This would be loud
Enough for a Record
if surface good —
Surface on Blue Amberol
very good didn't bother
Even with softest playing
a horn
Piano 10 ft away
6x26 ~~opening~~ used
6x24 is louder

Notice on Piano with Loudens
Quite dimensional + defects
Commence to show —
1 note is entirely too loud
yet in medium playing
its there but not so
Conspicuous —

77 + 57 quad

77 softer quality — Bunki —

Both about same loud

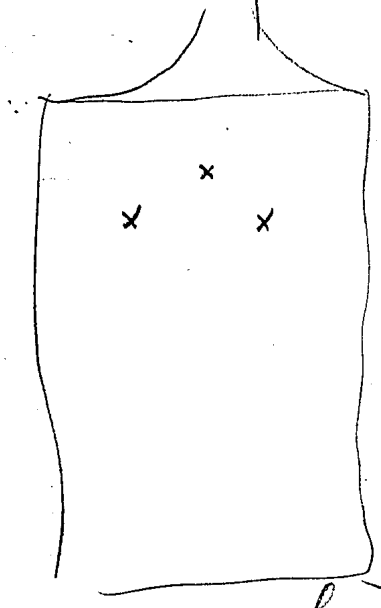
57 — 100 L 100 Qual —

old style 70 002 mica 100 L
Quality 105
but something
skips —

Same with Alum Center 110 Loud
Quality 105 —
but something Skips
+ not Even —

Both Micas old style more mellow +
round but something at times
comes in wrong — Center Al
Loudens
57 generally is better.
but others have preference
greatly although 57 is good

65. 14/16 — jap p. Loud 105
Quality - 110 - but tendency
to blub — Kennedy says
paper has wrinkles —
Tightened it — Loud 95
Quality same as 5th —



× 3 Violins
in Unison
"Overwoods" by
Ear - Compound
tone doesn't seem to
be in Euclidean
Rounds like

one Loud poor Violin
player

I notice when 3 Violins play
an Bach without
Piano or leader its
very poor
but when Leader
Beats time it
improves it Enormously
When Each Violin makes
long note it is cloudy
generally but when
all three play same
note its Wavy as to
Volume waves is irregular

When I took off the top of
Cell Room - The cocoa nearly
disappeared - So the
phenomenon is due
to something of movement
of a small air Volume
When 3 Violins were
used it was fairly
loud, but when
Cello quit in & Violinist
shoved to side it
was very much
weaker - any

recession from Center line is very noticeable in relation to Volume

Taking off top has apparently not weaked Volume Much

The Cello is weakest player —

59 Piano — Taking off top has weakened Vol very little say to go quietly is impossible

The one note which was very loud is now normal & mellow —

To stop these 4 per sec wavy it looks as if the room should be high & wide —

The violin is the worst instrument for Volume
Piano the best.
If we get Violin with Volume all else is easy

Room Top off 12X12

#105 .001 Mica
.001 x 5/16 alumn Cones

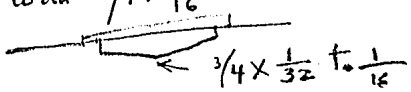
50% only loud of 57 —
Mellow quality good

The 12X12 is 25% louder
loud than 12X9 with top on

57 - 100% (norm)
66 — 110 " mellow but certain
notes blatted out
65 125 " Same defect as
66 - Notes blatted out but
very mellow + fine quality
but thick on verge of
blast

65 Tapered tubes – Domed head
14/16" .0015 Disc paper

66 – Tapered tubes, Domed head
15/16 – .0015 disc paper
with 3/4 × 1/16 Cork underneath



57 – Reg flat head – no taper
paper 1" alto sax .0015 paper
sharper –

65 stay as for
on Piano –

I notice base is better on 57
than 65 or 66 – at end of over W
1st part, But base all thru
seems better on 66+65 –

Notice 65 is on verge of
Blubs – 2 faint ones noticed

65 Tightened up slightly is
now in every way superior
to 57. More mellow &
10% @ 15% louder better
base –

The scale on 57 is poor although
the playing seems good –
there are 2 or 3 blubs & it
sounds on scale unnatural
whereas no blubs on 65
& natural = 10 high notes

played on high before I heard any music —

It seemed behind to beat 65 on scale —

65 = 3 + 5 ft 2 violins
our Bach not much
difference in Vol – Vol
good, 3/4 of what will
do commercially
Violins in Unison —
Very good in fact good
Enough with 65
Top of DEn off —
Violinist in center line
We get the Wavy

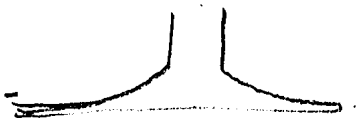
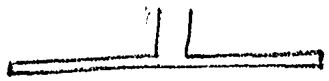
Should expect an funnel steady
outline —

2=Violins ~~[illegible]~~ playing
together increase loudness
apparently over 1 Violin
as they Equally play together
with Beats

Dextelle Lucia — no music
Except Piano — DEn 12X12
top off —
fixed position, pretty faint
but all defined at points

2nd trial Walking about
same as on stage
This is Enormously better

Louder & far more
Dramatic — 25%
more loudness it it
will be OK as to
Loud & quietly —
no indifference —
It sounds like
real Opera — Every
Voice is separate &
no noise as they come
together —
with good singers &
20% more loud would
pass it

It looks as if 
was better than 

In all these tests there is a dullness due to long funnel or Hard sides but its not bad — + if not eradicated or diminished will still be OK — But think can get it down

65 is far better quality + Loudness to 59 —

59 which is not tapered tube or has a domed head —

Does 65 have these to an improvement,

64 – 65 – 66 –

7/8 x .0015 – Doomed hard
tapered lines aluminum

70 – 71 – Dome 7/8 1/16 high
.0015 – aluminum as
electrolyzing ugly –

65 & 64 are best –
66 next –

75 1 1/2 paper

64 – 1/4 Food paper

64 – nearly a Dup best quality
not quite up on 2 notes,

66 – 80% land – ✓

70 50% land ✓

71 55% Blurb Good Pg ✓ ng

69 75% land ✓

76 – 75 @ 80 land ✓

75 about same as 65–64
in land & quality

65 64 75 all have a blub
in same place in Soldiers
Chorus —
Otherwise OK —
3 Violins 2 1st, 2nd & Cello —

Top off room — makes it as loud &
not louder — 64 65 & 75
all loud but badly blubs
2 ft from horn +
notice saw tooth in violins +
wavy —
We now try same thing
4 ft away from horn
Blub is just as bad —
Think must have the top on
will put it back on & try it
The violins dont sound much better
but tone as whole much
improved — May be that
bad tone close up is due
to Dia working too much
on limits —
Top put back not so loud
blubs just as much but
quality little more mellow

It looks as if Top off will be louder and nearly as good if it is essential for Convenience to have it off — But Top on will probably give somewhat tone if not so loud —

The 3 Recordings 64-65 75 = have been threatened for Friday Sat Sunday & now 2 pm Monday shows they are too sensitive having lost part of their stretch & are more sensitive — Friday there was only 1 or 2 weak blubs & now all blub badly —

tightened up 75 at no
longer blubs on Soldiers
Chorus – ~~but~~ fairly
loud – CCC Violins
& Piano –
but they don't play
right = on high Violin
thin = & the 2 2nd
Violins are wavey
in fact altogether
too much wave
in it – when they
give long notes,

Think their music
should be printed on
Cloth & wire stands
used Coated with
felt noise going on
all thru but faint

Tried ~~[illegible]~~ 55 — Cork couler
Shelled all away — 14/16 —
no aluminum —
50 Lined — Denatcher
1/32 3/32 0015 paper

66 — About same as
others in 65-75 Lined —
quality about same
1½/1000 paper — like 65 except
paper is 0015 instead of 001 as
in 65. Blues in 2 places
on Soldiers Chorus &
Violins, Piano & Cello.
Showed necessary 002
0025 003 — paper

76 & 77 Both have
Hubs in with Soldiers
Chamois - 77 has 2
not very bad Compared
to many others

75 - the tightened one - of 100 Load
then 76 is 110 - Quad ok -
Jap paper 003 12/16 al center
amplified arm

77 110% Load - 003 Jap paper
12/16 - al center Standard
arm - Quad ok -

Burke made 76-77

Viola is a violin with E string left off. + one lower tone string added

~~A Viola~~ a violinist can play a viola after he has had practice

A Violin can be turned to be a Viola - but must play one note lower, not easy as he would have to

use Violin music & play one note lower he could not use Viola music —

By putting 2 1/32 thick rubber under E string it softens it & makes reminder tone -

If Rubber put under all lower volume - acts like a Mute

Best is only to use under E string -

I noticed that if 2 Violin players tune E string perfectly that they can play together quite perfect without beats but if one violin is just a shade out of tune you hear the beats perfect, (12) saw teeth.

If all violins are discarded & Violas substituted, no change is necessary in Piano or any other instruments

But all the Violin Music would have to be rewritten for Viola Except where performer could transpose it can be played

I notice two Violin Each playing seperate on say E string Can make Even volume sustained notes

but when they play together
The sustained notes are
irregularly wavy in volume
& after many experiments
cannot get them to play
even volume — some
notes are steady but
most are 3 per second
wavy — at times there
are 10 to 15 per second but
this dont occur often
this is undoubtedly due
to fingers not being in
right spot — I also

believe the irregular wavy
$1\frac{1}{2}$ per sec is due to the
movement of the fingers on
the string due to disturbance
of bowing —
When they do the usual
vibrating the wavy
is exaggerated.

Another thing neither
violinist could hear China
"wavy"

Two Violins playing same scale together — E string the tight bow makes a little less wavy than loose bow

The Consequences of the wavy diminishes from E string to bass — E is by far the worst,

In double stopping the wavy disappears & we have 5 @ 6 per second pure beats

They do not seem to be able to strike the pitch at all on both playing same note double stopped *

2 Violins —

1 plays E the other next to it
no wawy —
no " " on all others
but when both play same
string wawy no [illegible]

When one plays octave higher than
the other on E string no wawy

If 1 Violin plays a note the 2nd
one plays a 3rd & the 3rd violin
plays a 5th — There is no
wawy

C E + G This is the 3
natural tones — & are
OK

45 & 66 same loud
Qual same —

66 has no surface —
65 & 90 loud some surface
65 95 " Strong loud surface

all 002 paper
14/16 disc Chrome 0015 thick —

On a piano the Right hand
plays the melody The
left the rythm, bass or as
the say harmony ~~[illegible]~~
~~[illegible]~~

Two Violins – one I put a clamp on E string at a certain point – The other Violinist played without a clamping – The notes were entirely free from Wawy

S S S

Notice when double clamping on first trial both strings were not same loudness + it doesnt sound like DS very poor

When I called their attention to this they tuned both strings with equal strength then it was good enough –

A Cello 1½ ft from edge
Horn 75 Reed scarcely any louder than 4 ft away
One big Elmo not ½ loud enough for Reg –

75 – 100%

#55 ½/100. Gasket checkmark allow

50% Scratchy –

55 in singing OK – 2 ft away –

#47 – Dia 1" Dia Jap paper
0015 – al dec 5/8 0015
Reg arm & tapering –

75 100% loud
47 250% loud
quality only fair

C D + G

played by 3 violins no good

no beats but not sweet + ng

C + G 2 violins –

just as bad, even worse –

no beats – or saw teeth

Viola 2 violins

playing a tenor report

OK, melodious –

loud –

2 Violins 3rds + 6ths
good – sweet, + OK –

ditto 2 Violin 3 + 6th +
1 Viola Octave lower –
pretty good,

with 3 Violin 1 3rd 1 6th +
the other in unison Get higher +
ditto lower Not so good
but they may be that it was
spoiled by poor playing
Cornet pretty good
however

Heraflex 49 is
100% loud

45 – 85@90% loud
3/4 dia .001 gap 1/2 .0015 al.
Scratched bad –

69 – paper .003 – al 7/8 x .003
50%

71 ditto 50% 1 1/4" Dia –
Paper too thick –

45 = OK for Bull Bass
3 ft away –
Bass Drum 4 ft
left, knife out –
Thunk Cup jumps –
will weight it –

Tried 2 Violins both run scale together, found 5 notes had beats.

I then put ear piece on Tube to one Violinist ear & held Cup over other Violinist Violin — both run scales & all notes were perfect no beats, The one with Ear piece kept in Tune with the other Violinist because he heard the other means Violin louder or as loud as his own

As Compared to 47-100
Number 46 - is 75%
5/8 Dia - 9/32 alum
~~[illegible]~~ ~~[illegible]~~ .0015 Celluloid
Quality good -

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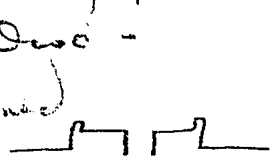
45 - 3/4 head .0015 paper
1/2 x .0015 al Disc -
This has been learned
90% -



X0100 - 1" head freq pattern
.002 paper 5/8 x .0015
Al disc Set with jig -
95%

G 9

3 Violins —

1st B
2 G
3 D

He only did a little on this —
This is rather good —

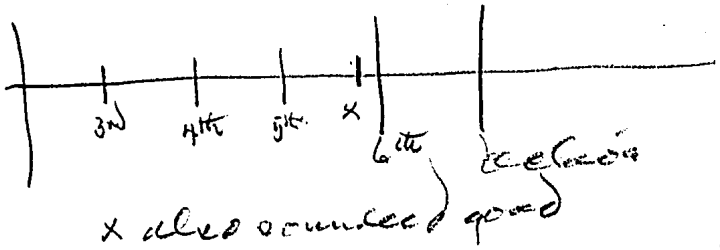
1st	B	1st violin	NG
	G	2nd "	
2nd	B	1st violin	
	D	2nd violin	

47 100
100 changed again 75 %

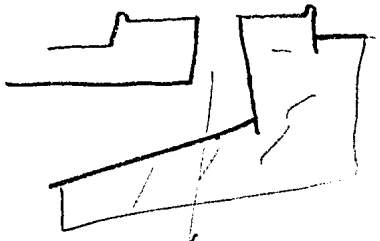
Jany 3rd 1916 ——

Rigging up Geller the Telescriber
Transmitter with small funnel
& ~~3~~ telefone head receivers
to 3 violins — 1 Cello
1 Viola 1 violin plays
funnel & the other
performer has pitch to
stop those and
one second beats.
Ultimately whole
Orchestra phased
have master Violinist
& tempo Conductor
if we ever Expect to
have properly played
music

Playing one string A
Contemporaneously the
other violinist run down
his string making sparks
where it bounced
Quoset we get this



All these Quotations are Guarantee



102 + 103

Like this which is:

Bad? —

47 — 100%

100 100 110 Crackly may be chips

1" heads .015" to paper

5/8 X .015" cel disc —

103 90% Very Crackly may be chips

100 100%

102 100% Cannot hear any scratch

103 100%

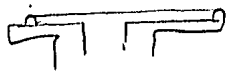
All good — But none

So loud as 100 when 1st heard — 100 blued then tightened it that accounts for being weaker

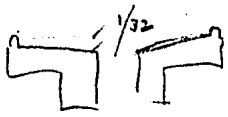
With #100 Fried Egg Drum
Original weight 55.7 grams
Added 14.8 grams to
keep Egg from jumping
off record —
The 14.8 Extra weight prevented
it from jumping off
10 ft, which it did before
weight was added
It jumps at 3 ft
Makes the sound Glug

but its slightly sharper —

In practice this shows that we can control quality by chamber size to a great extent, sharper by small chamber more round & mellow & duller by larger chamber



#100 —



102 & 103

The 102 & 103 are softer & more mellow — 102 is 105 as compared to 100 & 103 is 92 as compared to 100 —

The quality is very striking in entoning the chamber cantoris now which is best for Piano. both are pleasing — rather like 100

4 violins running scale
on E string —
3 violins give 3rd note
loudest almost double
loud —
One gave 4th note loudest
3 gives weakest note on
the 8th — The 4th being
loud & the sudden loss of
volume in striking, the
3 times weaker

One gives 4th note the
weakest,

Notice none of the violinist
pay any attention to
volume of sound on
E string. Then bows
wander to & from the
bridge in even running

Jany 6 1916 E String Experiments

the scale
When they played the same distance around the bridge the loudness was almost as it should be all along the scale although noticeable drop on G the note
There seems to be a break here on all violins —

One violin Guarnerius it is said to be is the poorest of the lot as it gives a noise sound on many of the E string notes, both with gut & metallic strings or all bows - This is strange

Impure —

one long note

false notes -

& Nothing stops it
Except by bowing various ways & it appears inherent in the violin itself —

Air Bach - for a long time we couldn't make it sound well at all — Then found Wilhelmj's Version was used which is written higher & for the cornet part of Violin

Got the Original in which Solo part taken by Violin in lower key
Used Master Violinist,

This was great improvement then found we were too slow in tempo made it quicker this was a great improvement Then made tempo really sharper & more abrupt This was another improvement then set high note Violins near finish — another improvement Set Cello further away this improves were Usefulness Violins playing Melody in all tests

found on long sustained
notes at end of a part beat
1/2 to 1 sec making Volume
sound wavey - Cautioned
the 2 Violinists to be more
Careful + play Exactly to
Master instrument, This
improved our

Finally suspected that
the 2 Violinists playing
Solo Could not play together
Exact Discared one of
used only one Solo
Violinist This made a
very great improvement

Found his Volume to much
Covering the high note
Violins, Moved him away
further from funnel -
This was the final
improvement of our
Band was fine much
better than our Regular

one — Moved Solo Violin
Still further back
This way no improvement

100 100%

116 $\frac{7}{8}$ dia $\frac{1}{32}$ dome
90%

101 1" Dia Curved dome
like Disc Repeater —
105%

100 Blubs on singing
Reg loudness but apply on
one note —
It may be cup counts weight = although
singing voice not loud enough to warrant

it = Possibly — The weight & Elasticity of wax making weight in fluid with certain notes & Clamps at to jump & blub — Tried 4 gradum but it only demanded blub a little

Tightened it loudness 75% no blubs — & clear but lower volumes too much tightened it too much

100 100 -- 1" Reg

115 - 96% 7/8 -
1/32 Roma - .0015 paper
1/2 x .0015 CC Mylar

116 - 90%
Same as 115 -

117 - Same as 115 95%

100 100% Paper

118 - 75% quality of paper

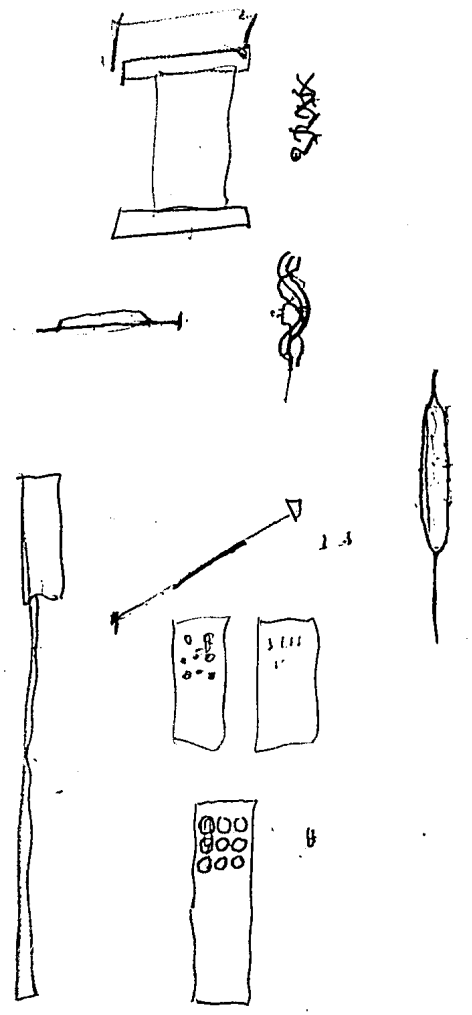
119 - 40%

120 - 65% quality like 118.

118 — 119 = 120

3/4 diameter
.0015 paper

ldl disc 7/16 X .0015.



100 100#

102 – 1" Dia – Celluloid
1/32 Dome
.0015 Celluloid – 75%/board
Aluminum Disc
5/8 X .0015 —

Sextette Lucia 101 Specorder

1st test –
arranged – Regular

Blubs a little, rather enjoyable
Sopphrano too loud – don't hear
alto, some noise –

2nd test. 101 Reds.
Arranged – Unison Baritone
omitted –

Clearer & more enjoyable
than 1st – Sophrano not quite
so loud but still too loud
Don't hear alto

3rd – 101 Reds
Arranged – Unison Baritone
omitted & tenor omitted where
singing octaves with Coloratura
Just as much noise as in 1st test
not so enjoyable as 2nd test
not so ~~disagreeable~~ Sop still too loud

100	100
101	100
102 —	80
	95 —
103	95 —

4th ~~test~~ 101 Reds

/ Arranged
Recording one Baritone
into a harmony part,

Sophrano too loud on
1st part — Baritone too
loud — Not very Enjoyable
poor swing to time

100	100 %
101	100 %
102	80
103	95 —
104	95

} Celluloid —

102-3-4 Exactly same as
101 Except Celluloid diaphram
in place of shellac paper
1" head $\frac{1}{32}$ down
Celluloid .0015 — Disc al
5/8 x .0015 Paper arm .008 Raphm

Personal Equation

Skolnik	6.5	
Featz	6.75	7.75
Hayes	7.25	8.25
Dawson	8	7.5
Ayres	9.25	
Ingrund	9.75	9
Applegate	10.5	10.75
Strickett	10.5	10.7
Walsh	10.75	
Anderson	10.75	
Sholder	11.5	
Solloway	12.5	
Eadie	12.75	
Renson	—	10.75

Spring Beautiful Spring

Map — of position

1st Violin	2
1st "	10
2 "	9
Cello	14
Viola	4

Pretty good — High violin vibrato too much in places — also scrapy on E string — [illegible] to beats between the 2 1st Violins

100 — 100%

118
119
120
} 3/4 Dia Celluloid Disc
.0005 — AP disc
7/16 x .0015

118 75%
119 60%
120 95%